

Release notes for ENDF/B Development n-092_U_231
evaluation



April 26, 2017

- fudge-4.0 Warnings:

1. Cross section does not match sum of linked reaction cross sections
crossSectionSum label 0: total (Error # 0): CS Sum.

WARNING: Cross section does not match sum of linked reaction cross sections! Max diff: 0.92%
2. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 1 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission] [nubar]): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
3. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 3 (total): / Form 'eval': / Component 0 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
4. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 3 (total): / Form 'eval': / Component 1 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
5. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 4 (n + U231): / Form 'eval': / Component 0 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
6. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 4 (n + U231): / Form 'eval': / Component 1 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small
7. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 6 (n[multiplicity:'2'] + U230 + gamma): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (8.287979e-10) is too small
8. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.
Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed'] + gamma [total fission]): / Form 'eval': / Component 0 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

9. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'1 delayed']) + gamma [total fission]): / Form 'eval': / Component 1 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

10. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 9 (n + (U231_e1 -> U231 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (1.552195e-12) is too small

11. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 10 (n + (U231_e2 -> U231 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (4.038638e-09) is too small

12. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 11 (n + (U231_e3 -> U231 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (8.469612e-09) is too small

13. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 12 (n + (U231_e4 -> U231 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (3.162090e-11) is too small

14. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 13 (n + (U231_e5 -> U231 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (8.134805e-09) is too small

15. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 14 (n + (U231_e6 -> U231 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (1.653748e-12) is too small

16. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 15 (n + (U231_c -> U231 + gamma)): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

17. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 16 ($U_{232} + \text{gamma}$): / Form 'eval': / Component 0 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

18. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 16 ($U_{232} + \text{gamma}$): / Form 'eval': / Component 1 (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

19. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 17 ($n + U_{231}$ [angular distribution]): / Form 'eval': (Error # 1): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

20. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 18 ($n[\text{multiplicity}:\text{'energyDependent'}, \text{emissionMode}:\text{'prompt'}] + n[\text{emissionMode}:\text{'1 delayed'}] + \text{gamma} [\text{total fission}] [\text{spectrum}]$): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

21. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 19 ($n[\text{multiplicity}:\text{'energyDependent'}, \text{emissionMode}:\text{'prompt'}] + n[\text{emissionMode}:\text{'1 delayed'}] + \text{gamma} [\text{total fission}] [\text{spectrum}]$): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

22. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 20 ($n[\text{multiplicity}:\text{'energyDependent'}, \text{emissionMode}:\text{'prompt'}] + n[\text{emissionMode}:\text{'1 delayed'}] + \text{gamma} [\text{total fission}] [\text{spectrum}]$): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

23. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.

Section 21 ($n[\text{multiplicity}:\text{'energyDependent'}, \text{emissionMode}:\text{'prompt'}] + n[\text{emissionMode}:\text{'1 delayed'}] + \text{gamma} [\text{total fission}] [\text{spectrum}]$): / Form 'eval': (Error # 0): Condition num.

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

- fudge-4.0 Errors:

1. Energy range of data set does not match cross section range
reaction label 7: n + (U231_c -> U231 + gamma) / Product: U231_c / Decay product: gamma_a / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (143715.0 -> 20000000.0) vs (102661.0 -> 20000000.0)
2. Energy range of data set does not match cross section range
reaction label 7: n + (U231_c -> U231 + gamma) / Product: U231_c / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (143715.0 -> 20000000.0) vs (102661.0 -> 20000000.0)
 WARNING: Domain doesn't match the cross section domain: (170000.0 -> 20000000.0) vs (102661.0 -> 20000000.0)
 WARNING: Domain doesn't match the cross section domain: (214894.0 -> 20000000.0) vs (102661.0 -> 20000000.0)
 WARNING: Domain doesn't match the cross section domain: (400000.0 -> 20000000.0) vs (102661.0 -> 20000000.0)
 ... plus 2 more instances of this message
3. Energy range of data set does not match cross section range
reaction label 7: n + (U231_c -> U231 + gamma) / Product: U231_c / Decay product: gamma_b / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (170000.0 -> 20000000.0) vs (102661.0 -> 20000000.0)
4. Energy range of data set does not match cross section range
reaction label 7: n + (U231_c -> U231 + gamma) / Product: U231_c / Decay product: gamma_c / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (214894.0 -> 20000000.0) vs (102661.0 -> 20000000.0)
5. Energy range of data set does not match cross section range
reaction label 7: n + (U231_c -> U231 + gamma) / Product: U231_c / Decay product: gamma_d / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (400000.0 -> 20000000.0) vs (102661.0 -> 20000000.0)
6. Energy range of data set does not match cross section range
reaction label 7: n + (U231_c -> U231 + gamma) / Product: U231_c / Decay product: gamma_e / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (300000.0 -> 20000000.0) vs (102661.0 -> 20000000.0)
7. Energy range of data set does not match cross section range
reaction label 7: n + (U231_c -> U231 + gamma) / Product: U231_c / Decay product: gamma_f / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (250000.0 -> 20000000.0) vs (102661.0 -> 20000000.0)
8. Calculated and tabulated Q values disagree.
reaction label 8: n[multiplicity:'2'] + U230 + gamma (Error # 0): Q mismatch

WARNING: Calculated and tabulated Q-values disagree: -5485027.860870361 eV vs -5878660. eV!
9. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_a / Multiplicity: (Error # 0): Domain mismatch (a)

- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
10. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_a / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
11. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_b / Multiplicity: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
12. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_b / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
13. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_c / Multiplicity: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
14. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_c / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
15. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_d / Multiplicity: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
16. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_d / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
17. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_e / Multiplicity: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
18. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_e / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)

19. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_f / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)

20. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_f / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)

21. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_g / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)

22. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_g / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)

23. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_h / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)

24. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_h / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)

25. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_i / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)

26. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_i / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)

27. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_j / Multiplicity: (Error # 0): Domain mismatch (a)

WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)

28. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_j / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
29. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_k / Multiplicity: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
30. Energy range of data set does not match cross section range
reaction label 8: n[multiplicity:'2'] + U230 + gamma / Product: gamma_k / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)
- WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (5904320.0 -> 20000000.0)
31. Calculated and tabulated Q values disagree.
reaction label 9: n[multiplicity:'3'] + U229 + gamma (Error # 0): Q mismatch
- WARNING: Calculated and tabulated Q-values disagree: -13152221.25552368 eV vs -1.35458e7 eV!
32. Calculated and tabulated Q values disagree.
reaction label 11: U232 + gamma (Error # 0): Q mismatch
- WARNING: Calculated and tabulated Q-values disagree: 7661579.353118896 eV vs 7267950. eV!
33. Multiplicity does not match sum of linked product multiplicities!
multiplicitySum label 9: n + (U231_c -> U231 + gamma) total gamma multiplicity (Error # 0): summedMultiplicityMismatch
- WARNING: Multiplicity does not match sum of linked product multiplicities! Max diff: 17.18%
34. Multiplicity does not match sum of linked product multiplicities!
multiplicitySum label 10: n[multiplicity:'2'] + U230 + gamma total gamma multiplicity (Error # 0): summedMultiplicityMismatch
- WARNING: Multiplicity does not match sum of linked product multiplicities! Max diff: 99.98%
35. Calculated and tabulated Q values disagree.
fissionComponent label 0: /reactionSuite/fissionComponents/fissionComponent[@label='0'] (Error # 0): Q mismatch
- WARNING: Calculated and tabulated Q-values disagree: 216148891214.943 eV vs 1.889816e8 eV!
36. Calculated and tabulated Q values disagree.
fissionComponent label 1: /reactionSuite/fissionComponents/fissionComponent[@label='1'] (Error # 0): Q mismatch
- WARNING: Calculated and tabulated Q-values disagree: 216148891214.943 eV vs 1.889816e8 eV!
37. Calculated and tabulated Q values disagree.
fissionComponent label 2: /reactionSuite/fissionComponents/fissionComponent[@label='2'] (Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: 216148891214.943 eV vs 1.889816e8 eV!
```

38. Calculated and tabulated Q values disagree.
fissionComponent label 3: /reactionSuite/fissionComponents/fissionComponent[@label='3']
(Error # 0): Q mismatch

```
WARNING: Calculated and tabulated Q-values disagree: 216148891214.943 eV vs 1.889816e8 eV!
```

39. A covariance matrix was not positive semi-definite, so it has negative eigenvalues.
Section 17 (n + U231 [angular distribution]): / Form 'eval': / LegendreLValue L=1 vs 1
(Error # 0): Bad evs

```
WARNING: 10 negative eigenvalues! Worst case = -7.718385e-05
```

- njoy2012 Warnings:

1. Evaluation has no resonance parameters given
unresr...calculation of unresolved resonance cross sections (0): No RR

```
---message from unresr---mat 9216 has no resonance parameters
copy as is to nout
```

2. In some evaluations, the partial fission reactions MT=19, 20, 21, and 38 are given in File 3, but no corresponding distributions are given. In these cases, it is assumed that MT=18 should be used for the fission neutron distributions.
heatr...prompt kerma (0): HEATR/hinit (3)

```
---message from hinit---mt19 has no spectrum
mt18 spectrum will be used.
```

3. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (1): HEATR/hinit (4)

```
---message from hinit---mf6, mt 16 does not give recoil za= 92230
one-particle recoil approx. used.
```

4. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (2): HEATR/hinit (4)

```
---message from hinit---mf6, mt 17 does not give recoil za= 92229
one-particle recoil approx. used.
```

5. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (3): HEATR/hinit (4)

```
---message from hinit---mf6, mt 51 does not give recoil za= 92231
one-particle recoil approx. used.
```

6. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (4): HEATR/hinit (4)

```
---message from hinit---mf6, mt 52 does not give recoil za= 92231
one-particle recoil approx. used.
```

7. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (5): HEATR/hinit (4)

---message from hinit---mf6, mt 53 does not give recoil za= 92231
one-particle recoil approx. used.

8. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (6): HEATR/hinit (4)

---message from hinit---mf6, mt 54 does not give recoil za= 92231
one-particle recoil approx. used.

9. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (7): HEATR/hinit (4)

---message from hinit---mf6, mt 55 does not give recoil za= 92231
one-particle recoil approx. used.

10. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (8): HEATR/hinit (4)

---message from hinit---mf6, mt 56 does not give recoil za= 92231
one-particle recoil approx. used.

11. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (9): HEATR/hinit (4)

---message from hinit---mf6, mt 91 does not give recoil za= 92231
one-particle recoil approx. used.

12. Recoil is not given, so one-particle recoil approximation used.
heatr...prompt kerma (10): HEATR/hinit (4)

---message from hinit---mf6, mt102 does not give recoil za= 92232
photon momentum recoil used.

13. There is a problem with the fission energy release.
heatr...prompt kerma (23): HEATR/nheat (3)

---message from nheat---changed q from 1.889816E+08 to 1.808867E+08
for mt 18

14. Evaluation has no resonance parameters given
purr...probabalistic unresolved calculation (0): No RR

---message from purr---mat 9216 has no resonance parameters
copy as is to nout